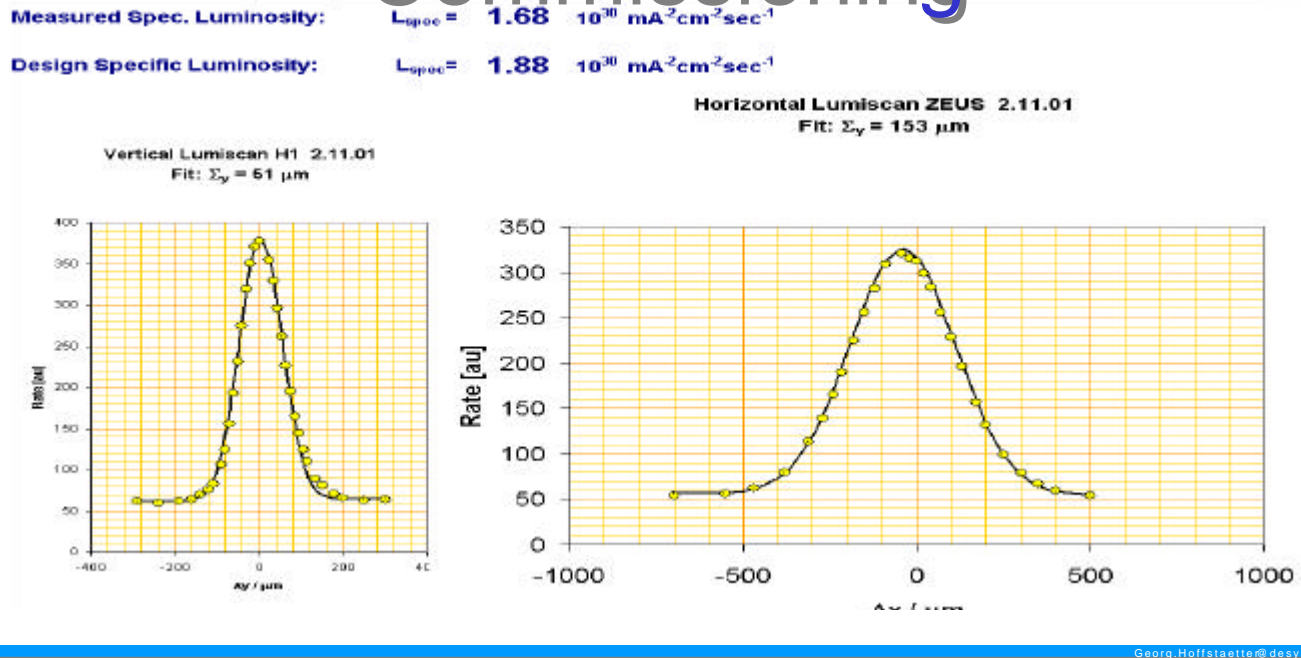


Status of HERA and Strategy

Time table of re-commissioning

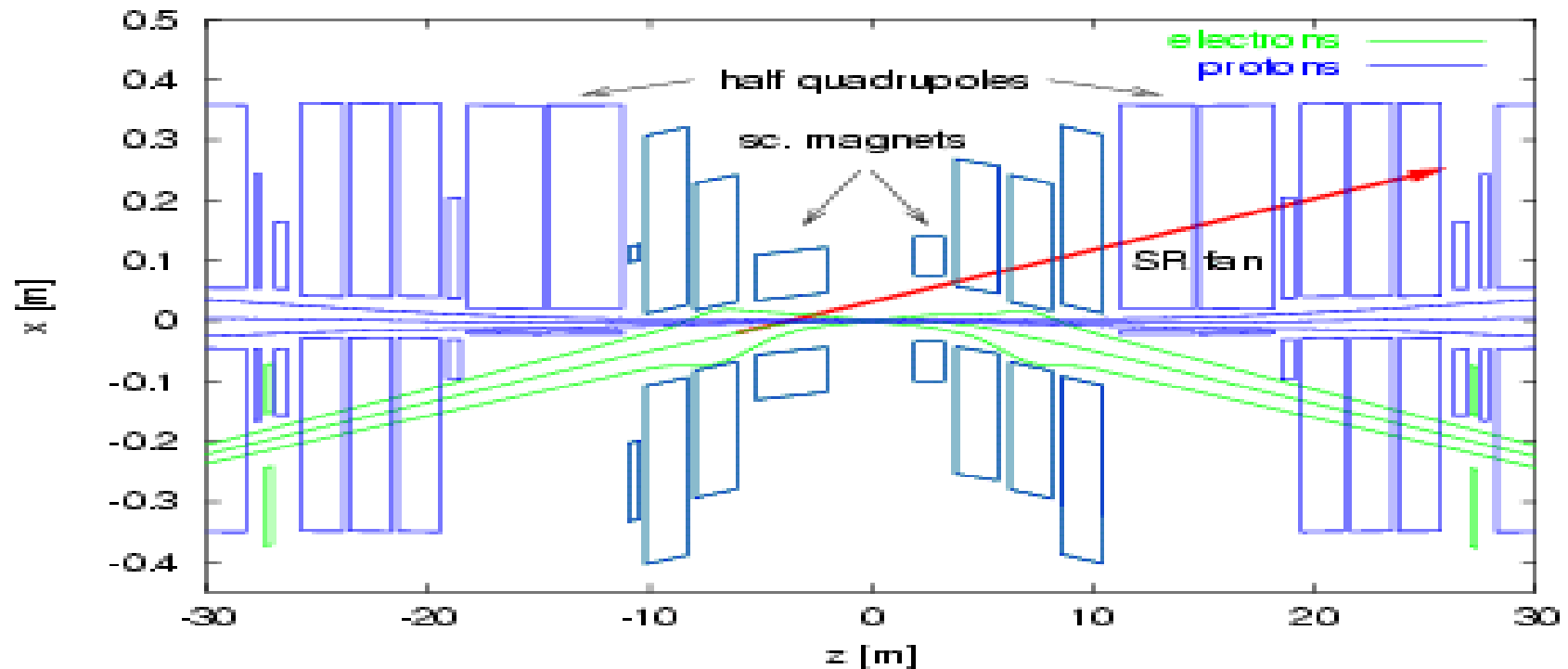
August 01	Re-commissioning of Proton ring
September	e-ring
October	Luminosity commissioning
November	Background studies
December	Beam based alignment; machine studies
January 02	Shutdown: Interlock test; various repairs

Summary of 2001 Commissioning



- The two rings with the new IR re-commissioned
- Model of the accelerator checked and debugged
- Influence of detector fields compensated
- Beam brought into collisions and verification of the expected specific luminosity with 80%

The upgrade has been a very ambitious and demanding project



Increase of the luminosity by the reduction of the beam cross section at the collision point due to stronger focusing with superconducting magnets inside H1 and ZEUS and increased beam currents compared to previous operation

Challenges

Very compact super conducting magnets with new technology (Brookhaven) Work as expected

Accelerator magnets inside the detector with difficult (weak) suspension, difficult alignment and positioning; interference with solenoid fields; practically inaccessible

!

Very special complicated normal conducting magnets. OK

No compensation solenoid but non local compensation by skew quadrupoles. Seems to work

Strong synchrotron radiation generated in the IR

!

Very complicated beam pipe and collimation system

Magnets on 'bridges' move depending on temperature

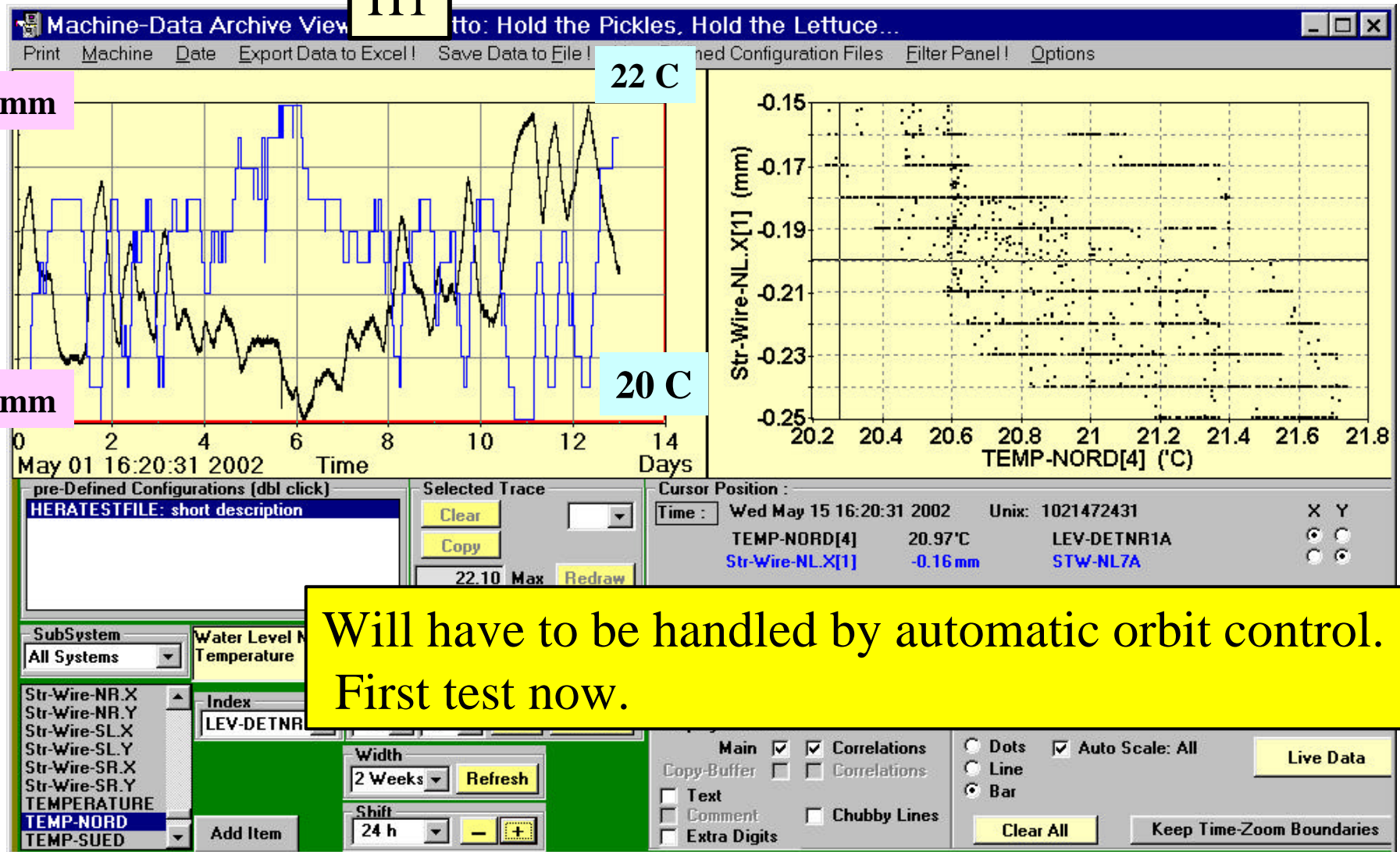
H1

-0.15 mm

22 C

-0.25 mm

20 C



Will have to be handled by automatic orbit control.
First test now.

Magnets on 'bridges' move depending on temperature

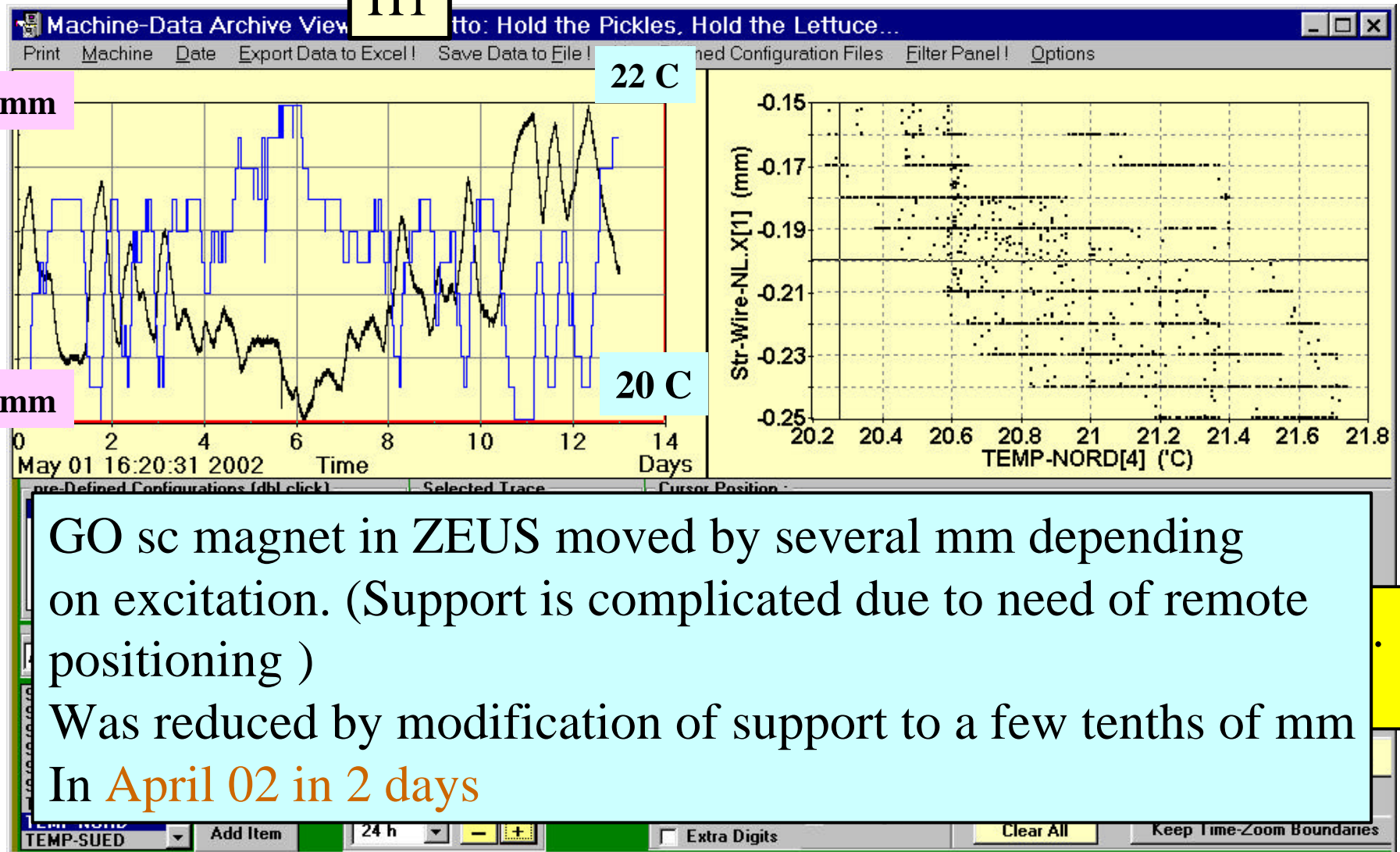
H1

-0.15 mm

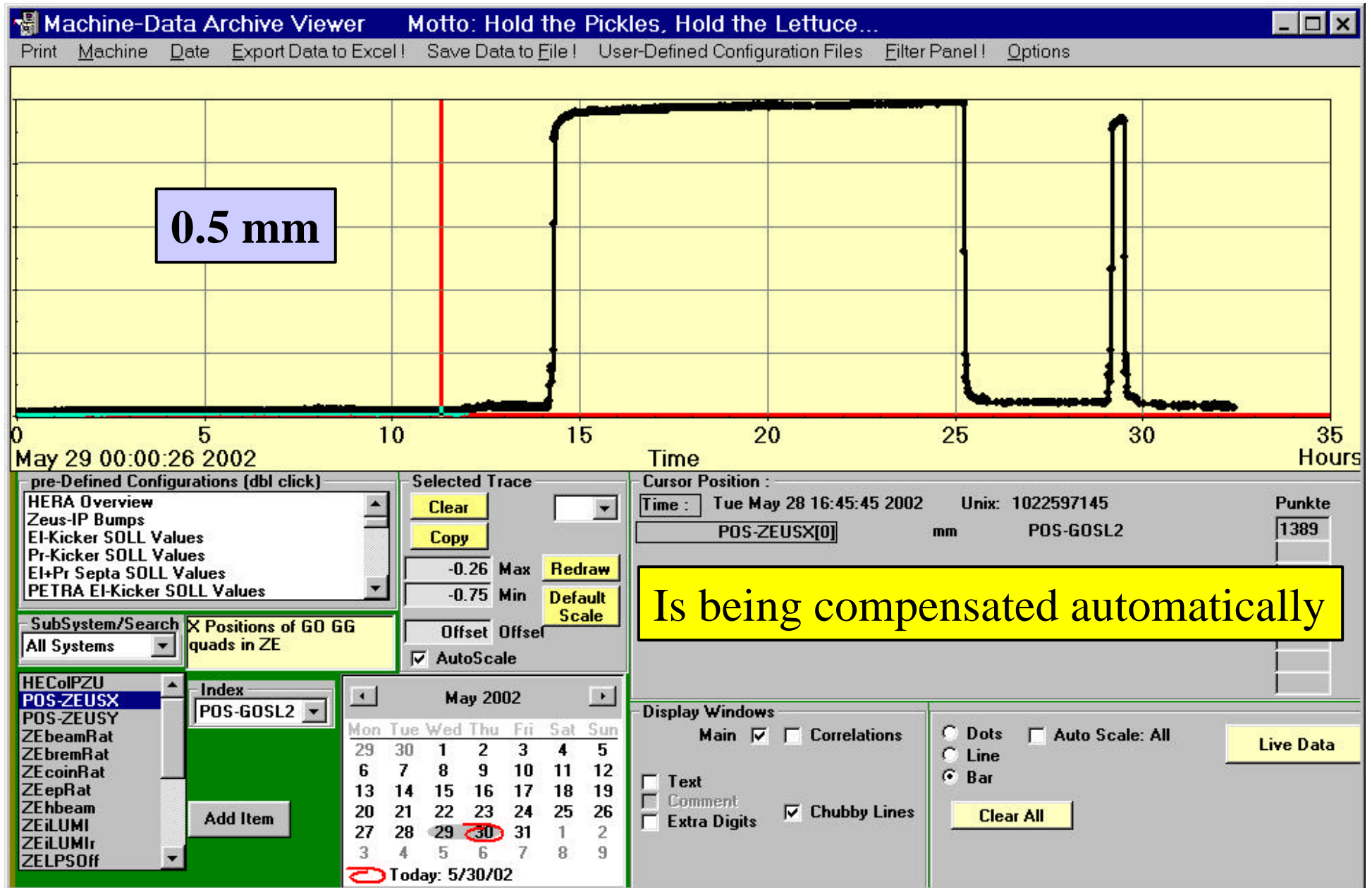
22 C

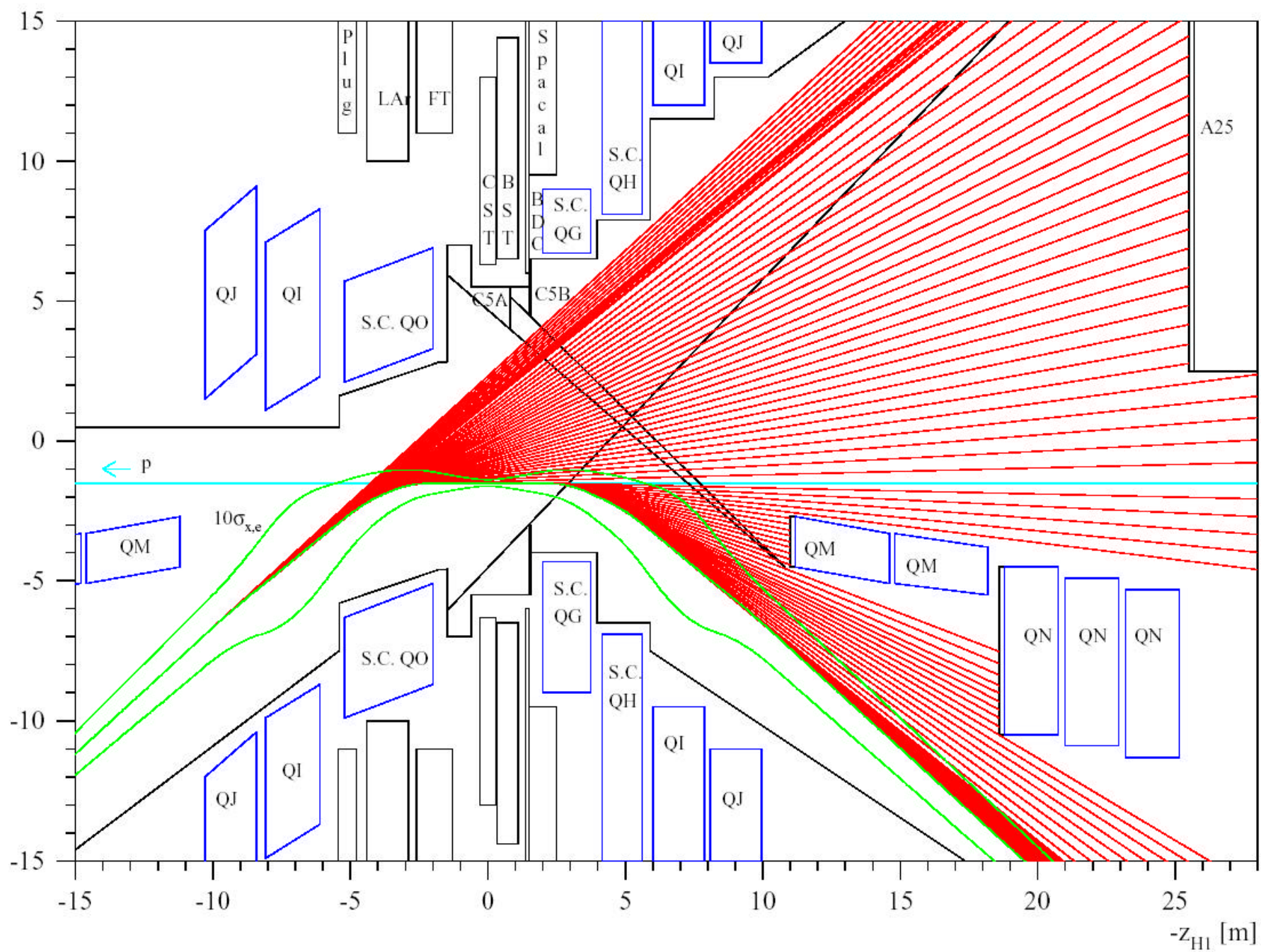
-0.25 mm

20 C



Movement of GO at ZEUS During Closing of the Calorimeter





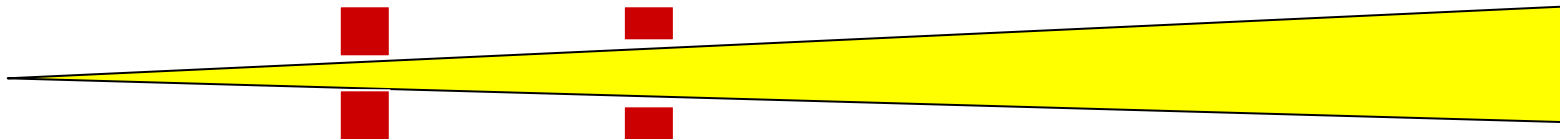
Background conditions were much worse than expected

First findings and improvements

Synchrotron radiation from the last bending magnet of the arc hit the beam pipe in the experimental area causing background. Effect had been overlooked

Was fixed by installing additional collimators. **February 02**

Mask to protect vacuum chamber against overheating by synchrotron radiation in case of miss-steering was too narrow vertically and produced backscattering of light



Vertical opening was increased from 9 to 16 mm

March 02
Fix 10 days

Status Today

Operating conditions for HERMES and HERA-B seem to be satisfactory.

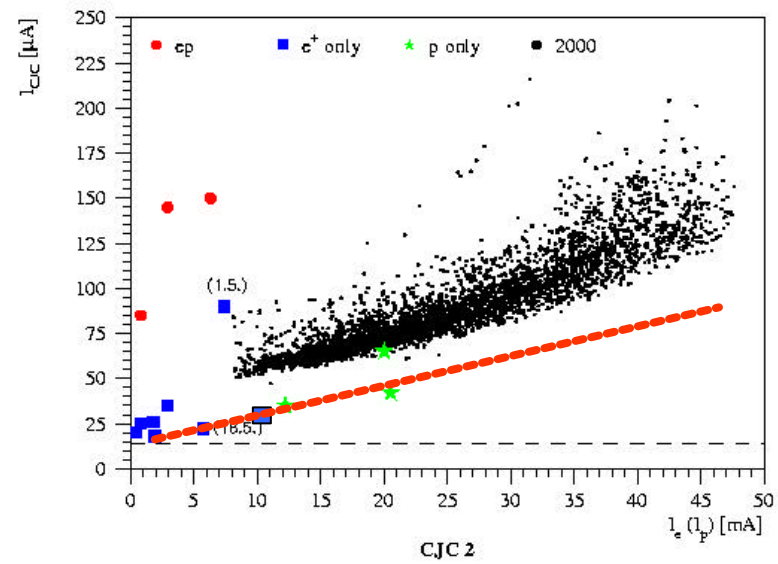
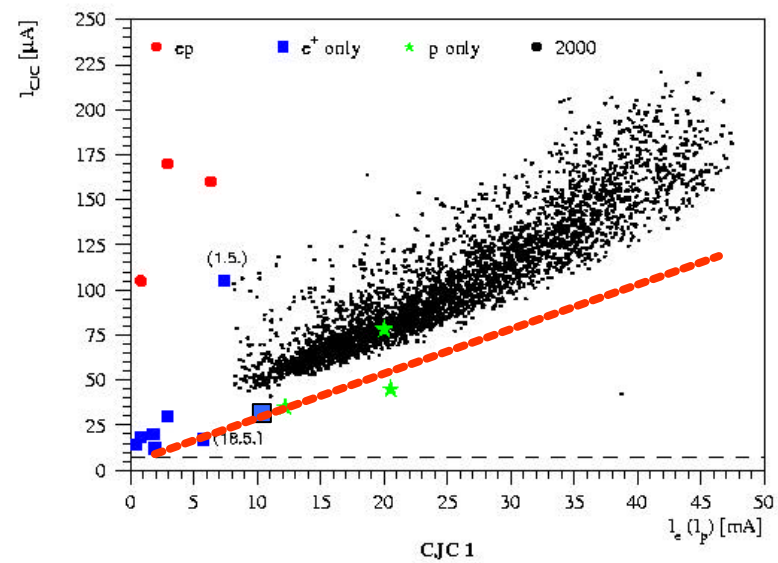
For H1 acceptable background conditions, when scaled to nominal e currents, were established ~~ONCE~~.

Proof of principal.

THREE TIMES

At ZEUS background are about factor 5 to 10 too high

H1 CJC currents 2000 and 2002 e^+



June 3rd 2002

Status Today

Operating conditions for HERMES and HERA-B seem to be satisfactory.

For H1 acceptable background conditions, when scaled to nominal e currents, were established ~~ONCE~~.

Proof of principal.

THREE TIMES

At ZEUS background are about factor 5 to 10 too high

Up to now we have not been successful to operate HERA in a reproducible way delivering luminosity to the collider experiments with acceptable background conditions

What are the reasons which have prevented this goal;
what has been done and has to be done
to get to satisfying conditions ?

Reasons

Technical problems:

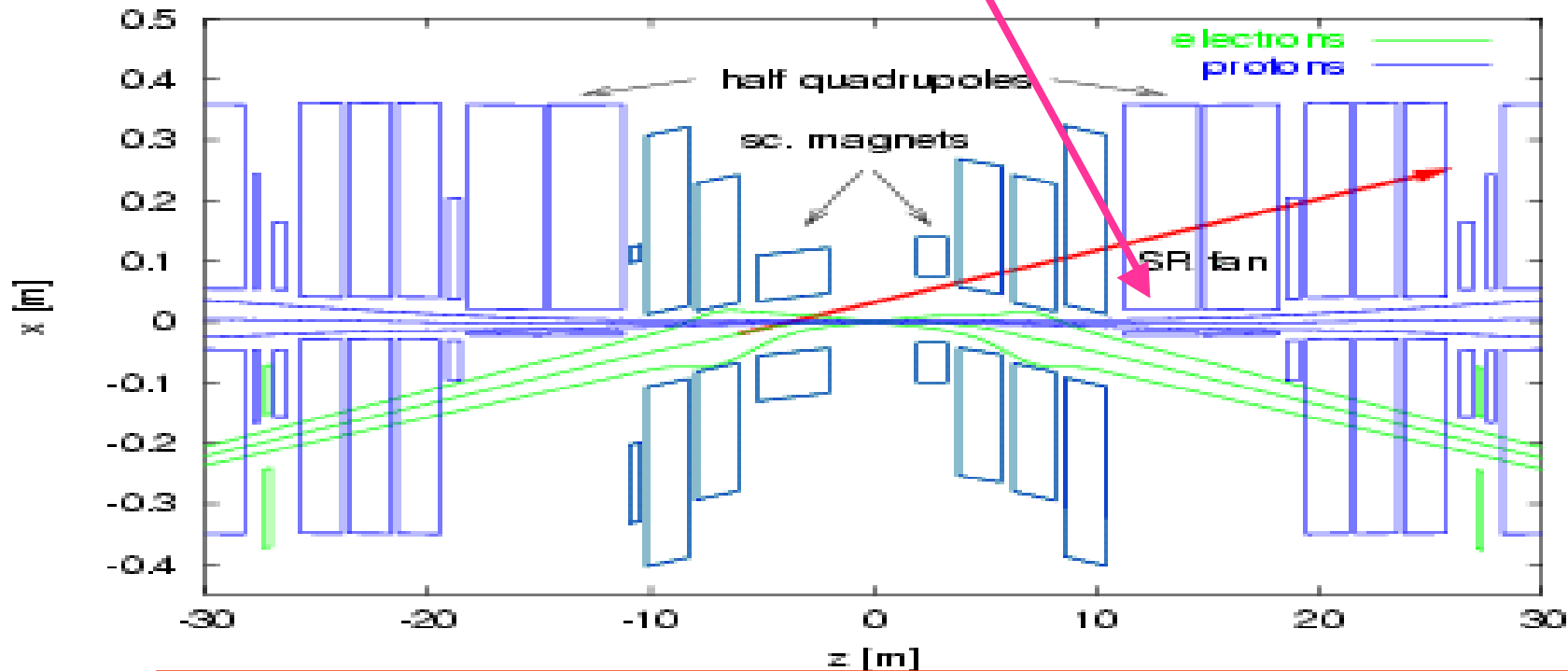
A series of technical problems has made systematic studies very difficult and ineffective

Major repair: ‘Cold straight section’ in proton ring had to be repaired as it severely reduced the proton beam aperture by a shifted beam tube. **January 02: Fix ~2 weeks**

Aperture reduction of positron beam by defect quadrupole.
April 02 Fix: 2 days

Lots of trips due to water cooling system + various
Has been improved and will be followed up.

Big Leak at Beam Pipe SR13

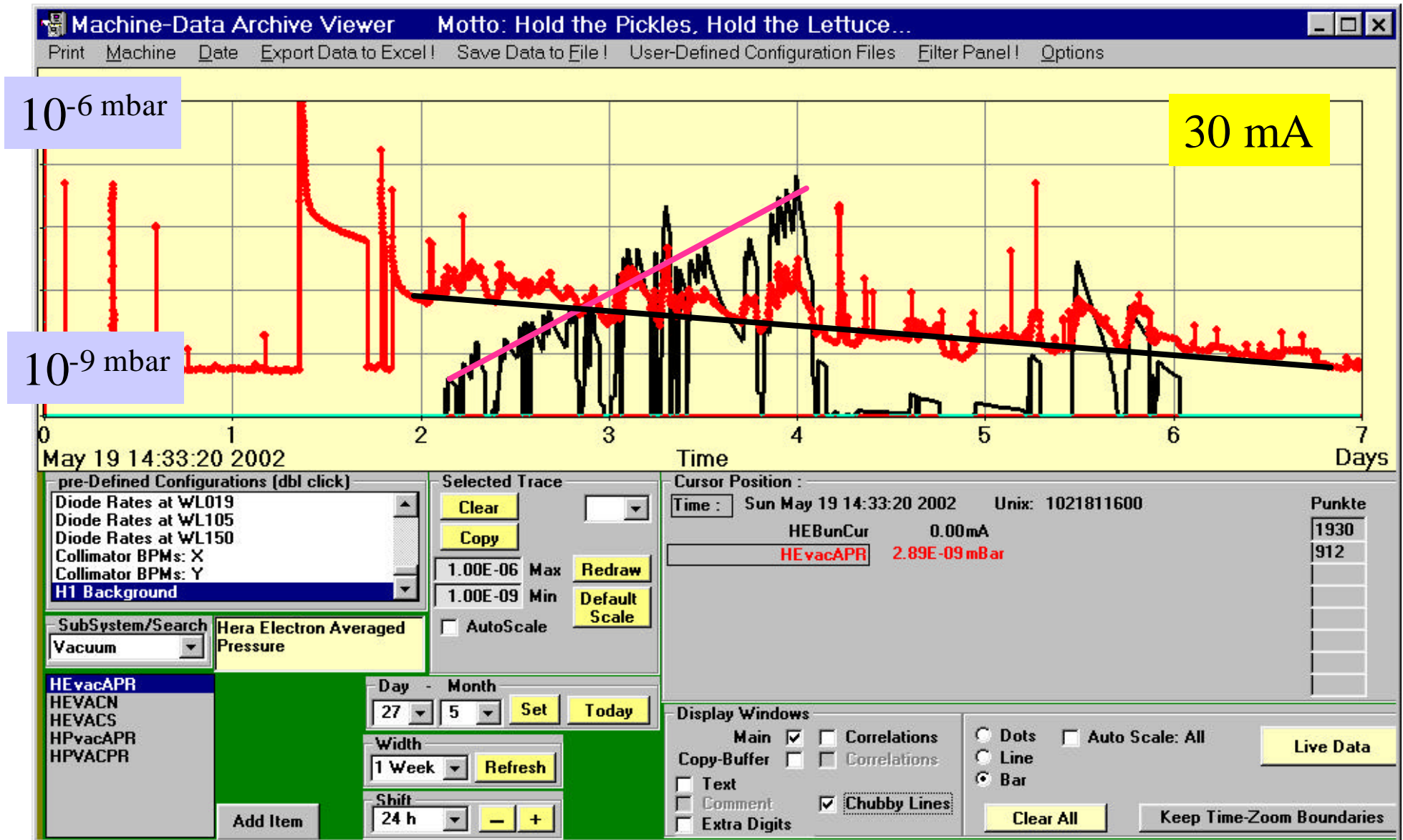


May 19th Whitsun Sunday !!

Shielding had to be removed; magnet had to be opened;
vacuum chamber had to be exchanged.

**Managed to get people necessary within a few hours
Two days later beam operation could be restarted**

Development Average Pressure



Actions and Strategy

The Desy directorate asked the Scientific Council to form a **Machine Advisory Committee** (February 02)

Focus program on understanding of **background** situation in the experiments as **highest priority item**-
In close collaboration with the experimental groups.

Once understood Find solutions

On technical problems:

Installed daily meeting with division leader or deputy between technical groups and shift crew to ensure direct communication and prompt action. (May 10th)

Installed taskforce with additional **manpower** from other activities since April 11th

2 days machine studies per week

Task Force on e-Beam Lifetime

Including the issues of: poor injection efficiency, poor lifetime in the lumifile, physical and dynamic aperture
Taskforce members: K. Balewski, H. Ehrlichmann, E. Gianfelice-Wendt, G. Hoffstätter, M. Minty, **Brinkmann**

Task Force on Beam Optics

Including the topics of Proton and lepton optics verification. Improving the understanding of coupling
Taskforce Members: E. Gianfelice, G.**Hoffstätter**, J.Keil, F.Brinker, R.Wanzenberg, W. Decking, **C.Kleinwort**

Taskforce on Proton Injection Efficiency

Including the topic of dynamic aperture at injection
Taskforce Members: H. Ehrlichmann, **B. Holzer**, F. Brinker, J.Maidment , **D.Notz, Schaffran**

Taskforce on Experimental Background

Including the issues of Synchrotron Radiation, Particle Background and Beam Based Alignment, Collimator settings and control
Taskforce Members: M.Bieler, K.Flöttmann, T.**Limberg**, G.Hoffstätter, M.Seidel, E.Vogel, W. Decking, **I.Bloch, U.Schneekloth, F.Metlica, C.Niebuhr, V.Lendermann, V.Andreev, M.Ehrenfried, E.Aschenauer, U.Koetz**

Taskforce on Operational Issues

Including topics of magnet mechanical stability, orbit corrections, operational procedures
Taskforce Members: R. Bacher, M. Bieler, H. Ehrlichmann, K. Flöttmann, S.**Herb**, **M.Lomperski, I.Bloch**

Taskforce on Luminosity Optimization

Taskforce Members: M. Lomperski, **R. Wanzenberg**, J. Keil, M. Dohlus

Taskforce on Reliability issues

Taskforce Members: M. Bieler, M. Minty

HERA scientific crew:

Bieler
Brinker
Dohlus
Gianfelice-Wendt
Hofstaetter
Holzer
Keil
Limberg
Lomperski
Schmitz
Wagner
Wanzenberg
Willeke

Additional people for task force:

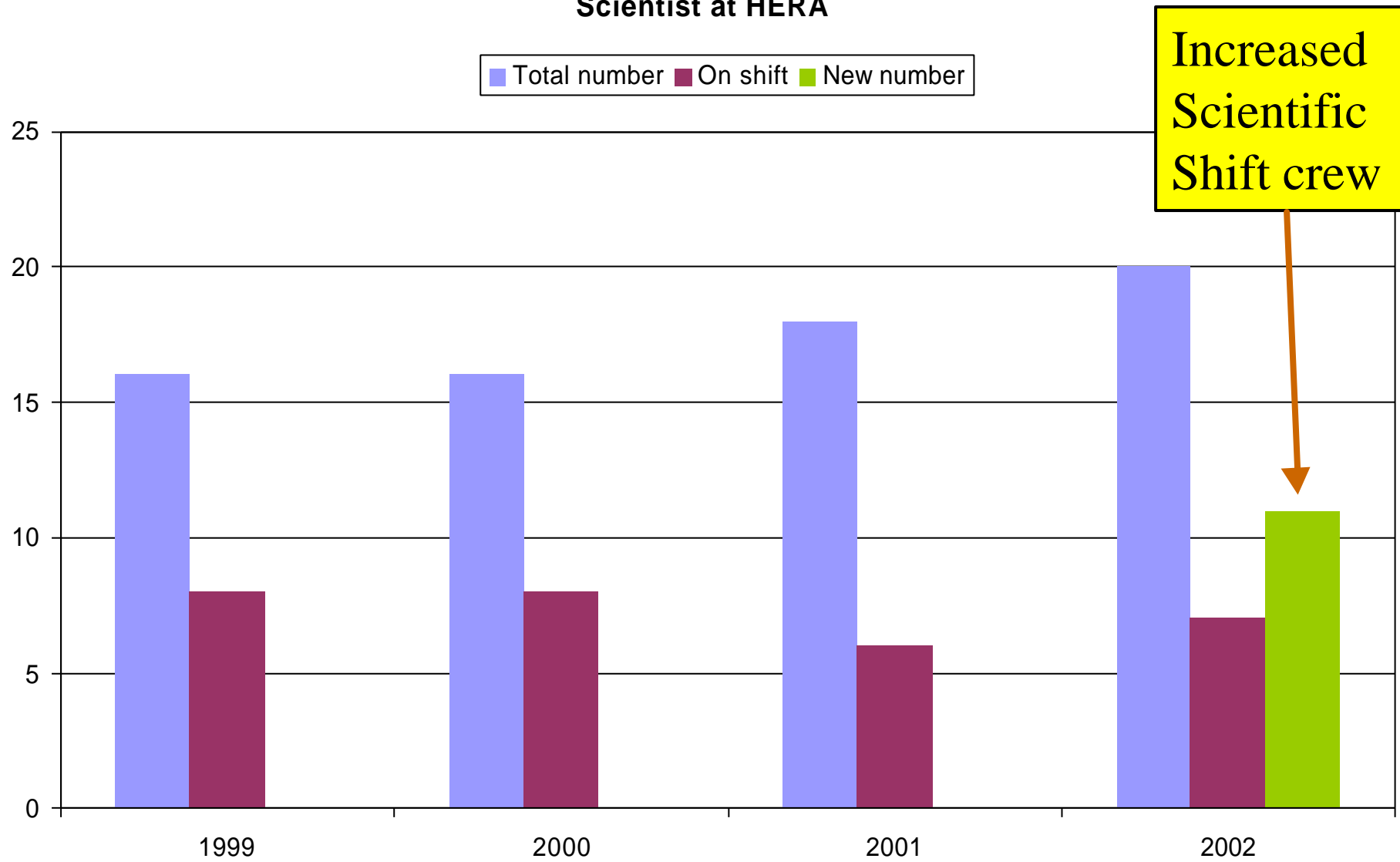
Bacher(group leader controls)
Barber (Polarisation)
Balewsky (PETRA)
Brinkmann (TESLA)
Decking (TESLA)
Ehrlichmann (PETRA/TESLA)
Floettmann (TTF/TESLA)
Herb (Controls)
Maidment (DESY)
Minty (DESY/TTF)
Seidel (group leader e vacuum)
Wittenburg (group leader diagnostics)

Some scientists with experience on storage rings will run shifts:

Decking (TESLA) Herb (Controls)
Noelle (TTF) Vogel (Postdoc) Vogt (from July)

Will try to hire 4 new scientists for HERA operation

Scientist at HERA



R.Klanner and D.Trines will coordinate the common efforts of the accelerator and experimental groups

The HERA coordination meetings between experiments and accelerator with the directorate will take place once a month to follow up the development and decide on further actions

Schedule:

At present there are dedicated background studies and vacuum conditioning.

During some shifts beams are supplied to HERMES and HERA-B.

June 4th and 5th are access days mainly for Hermes; in addition repair work

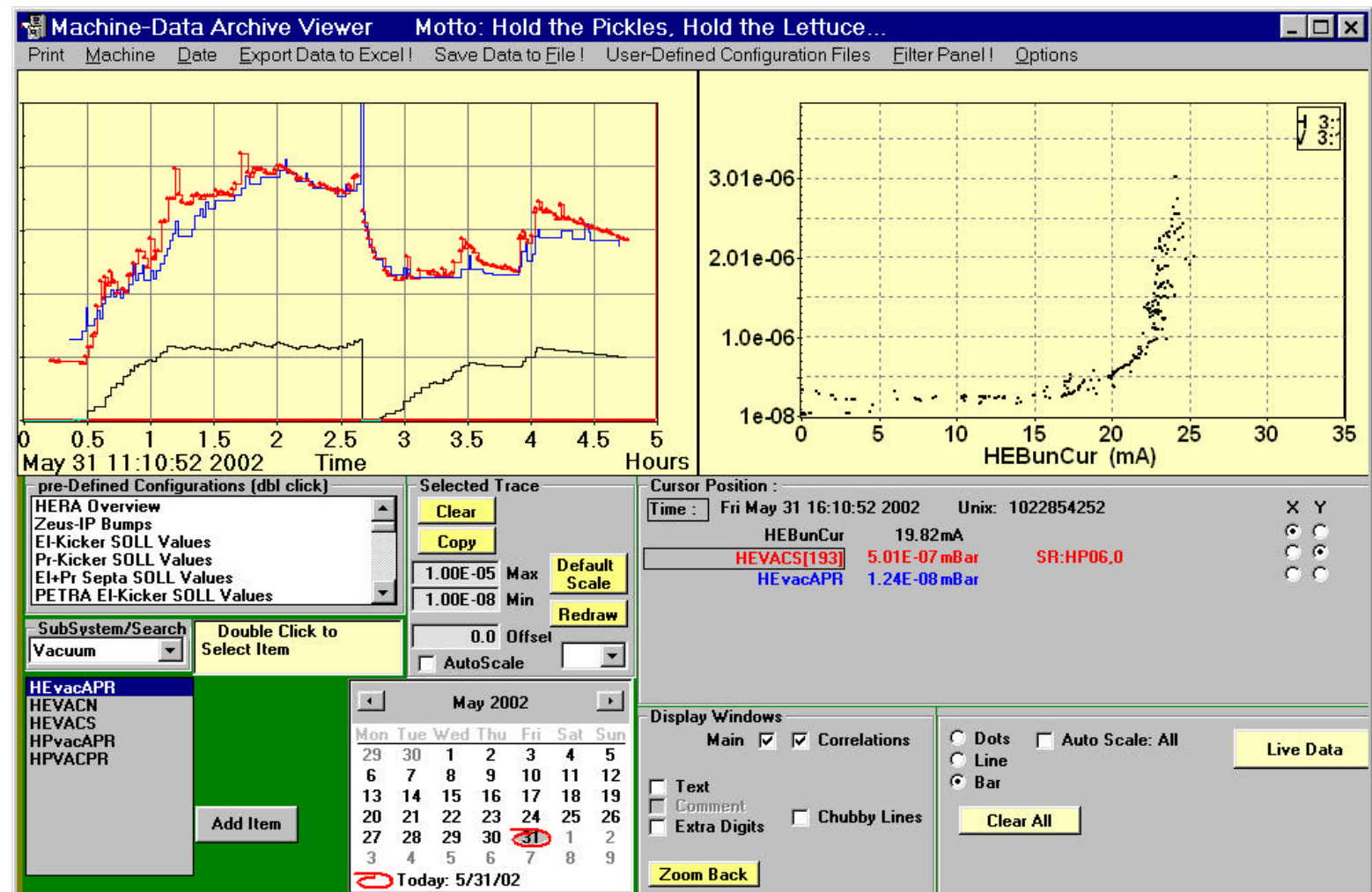
The further schedule depends on the progress on the accelerator. A change to electrons only makes sense after establishing proper conditions concerning backgrounds and luminosity with e+

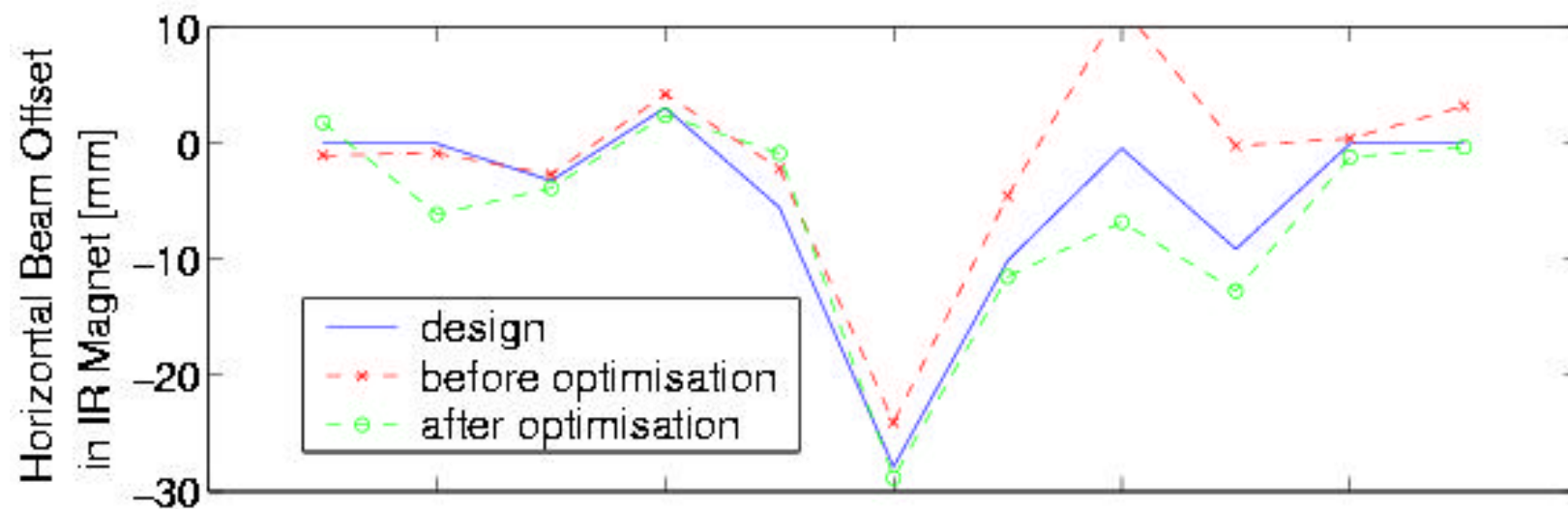
A shutdown is tentatively scheduled for beginning of next year. However this may be limited to the time needed for the interlock test required by law.

Recent Results From Studies

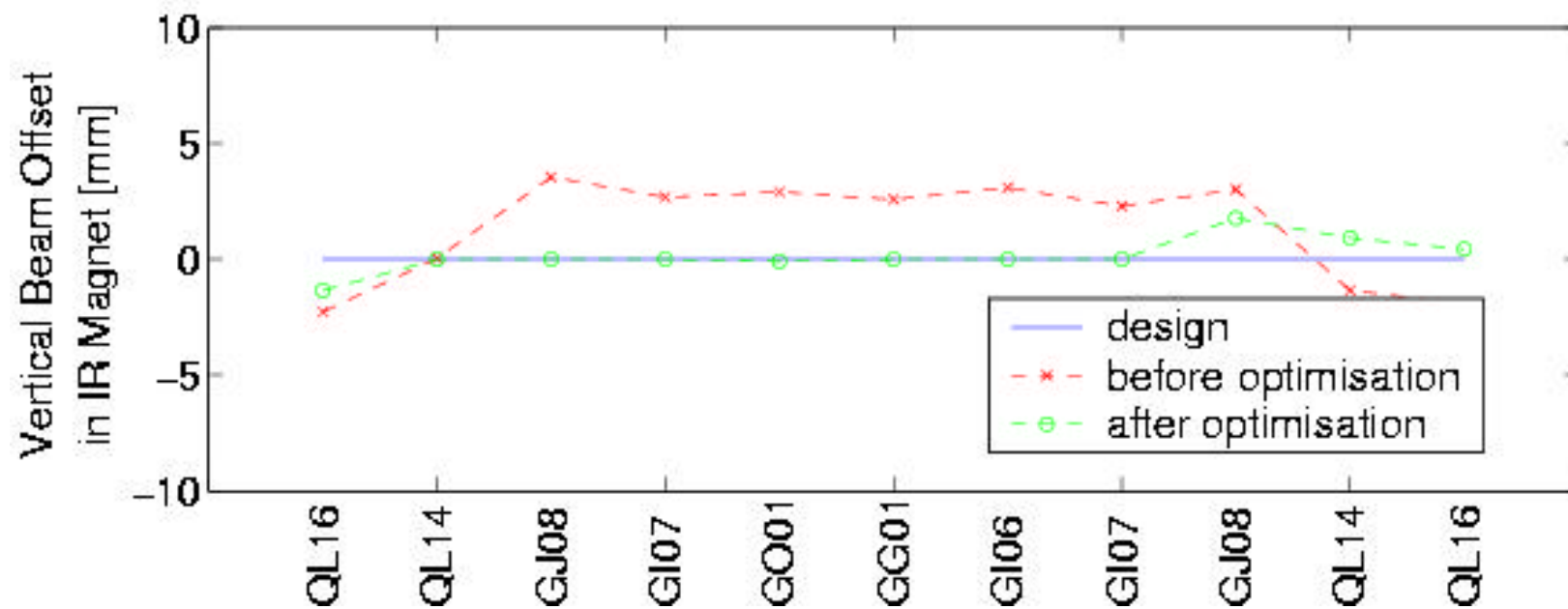
When trying to improve background conditions at ZEUS last week it was established that background at ZEUS right now is dominated by beam gas events in the experiment

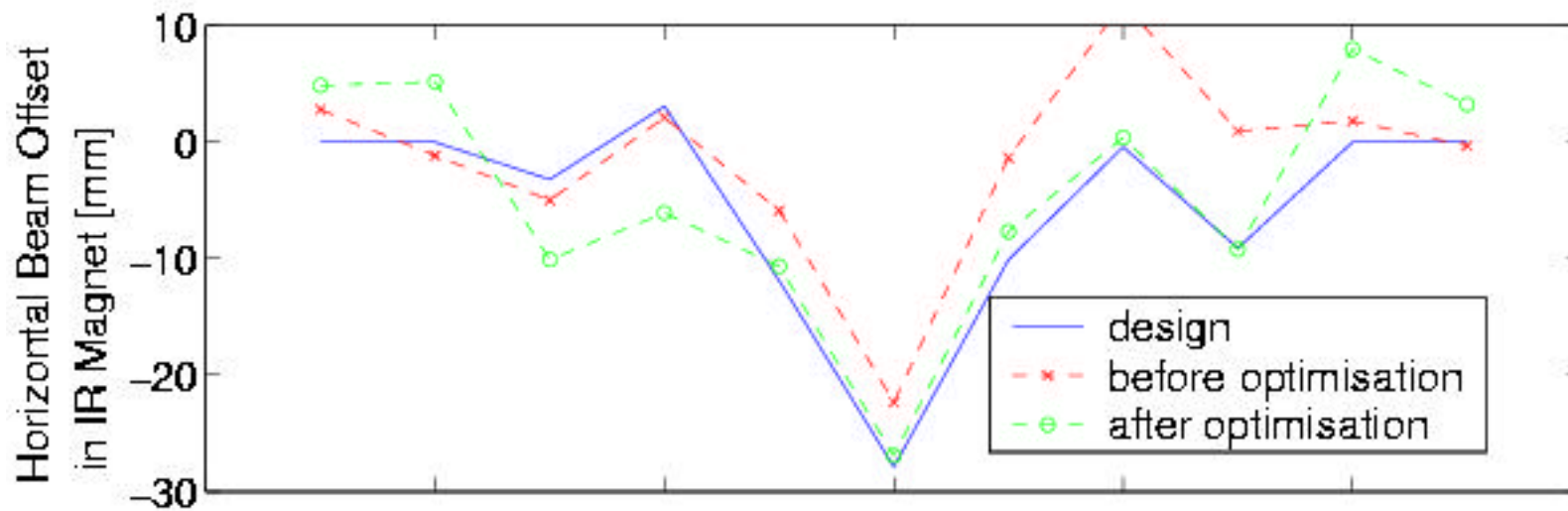
Bakeout
with
beam



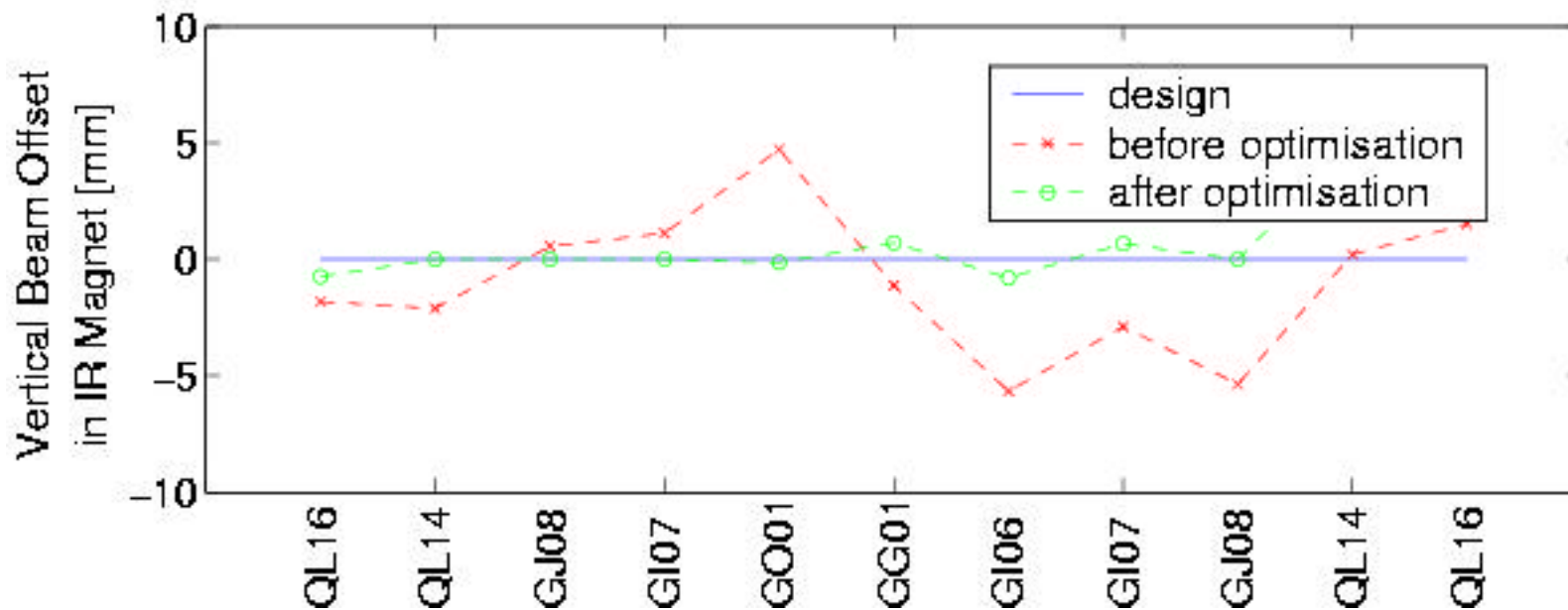


Beam based alignment at ZEUS



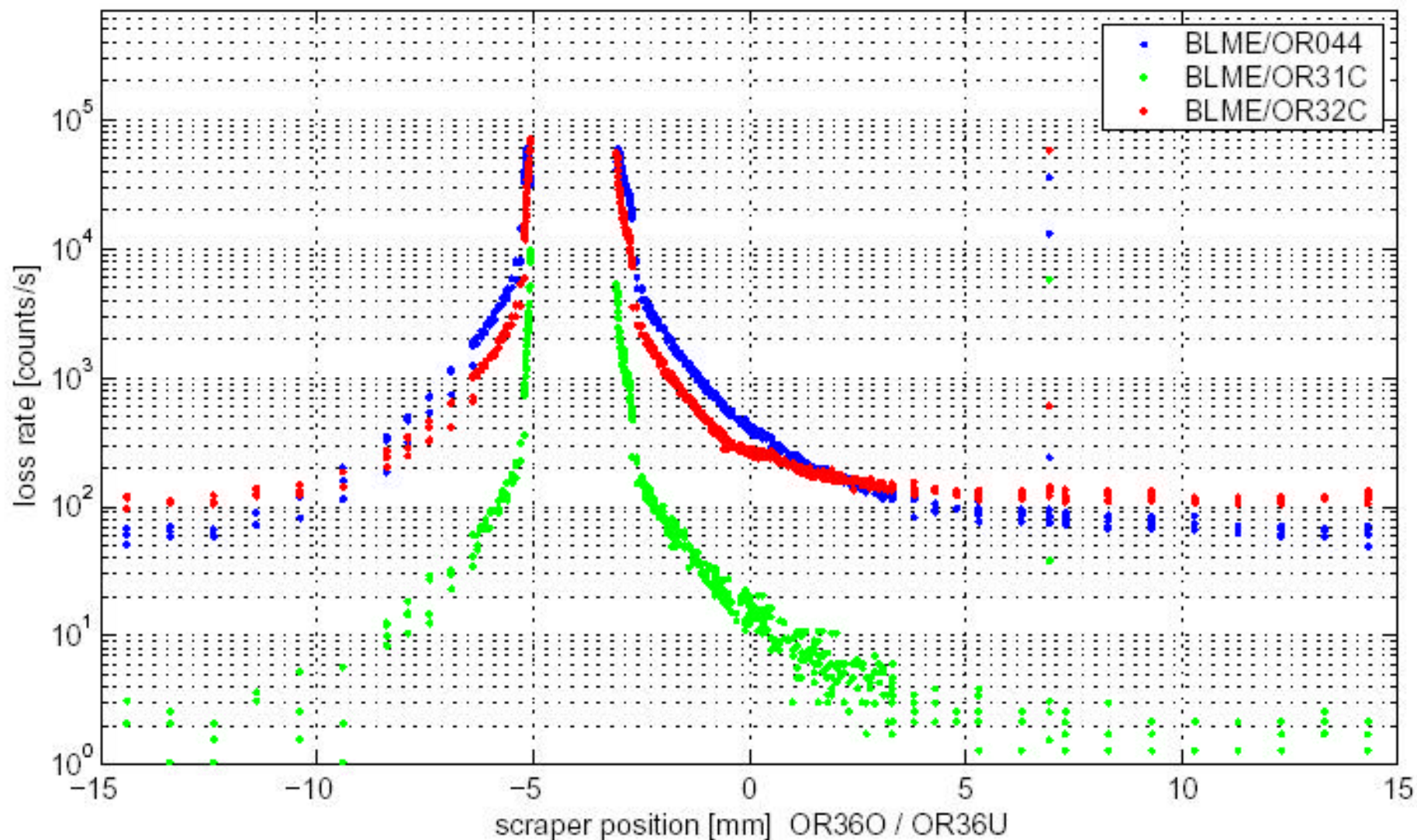


Beam based alignment at H1

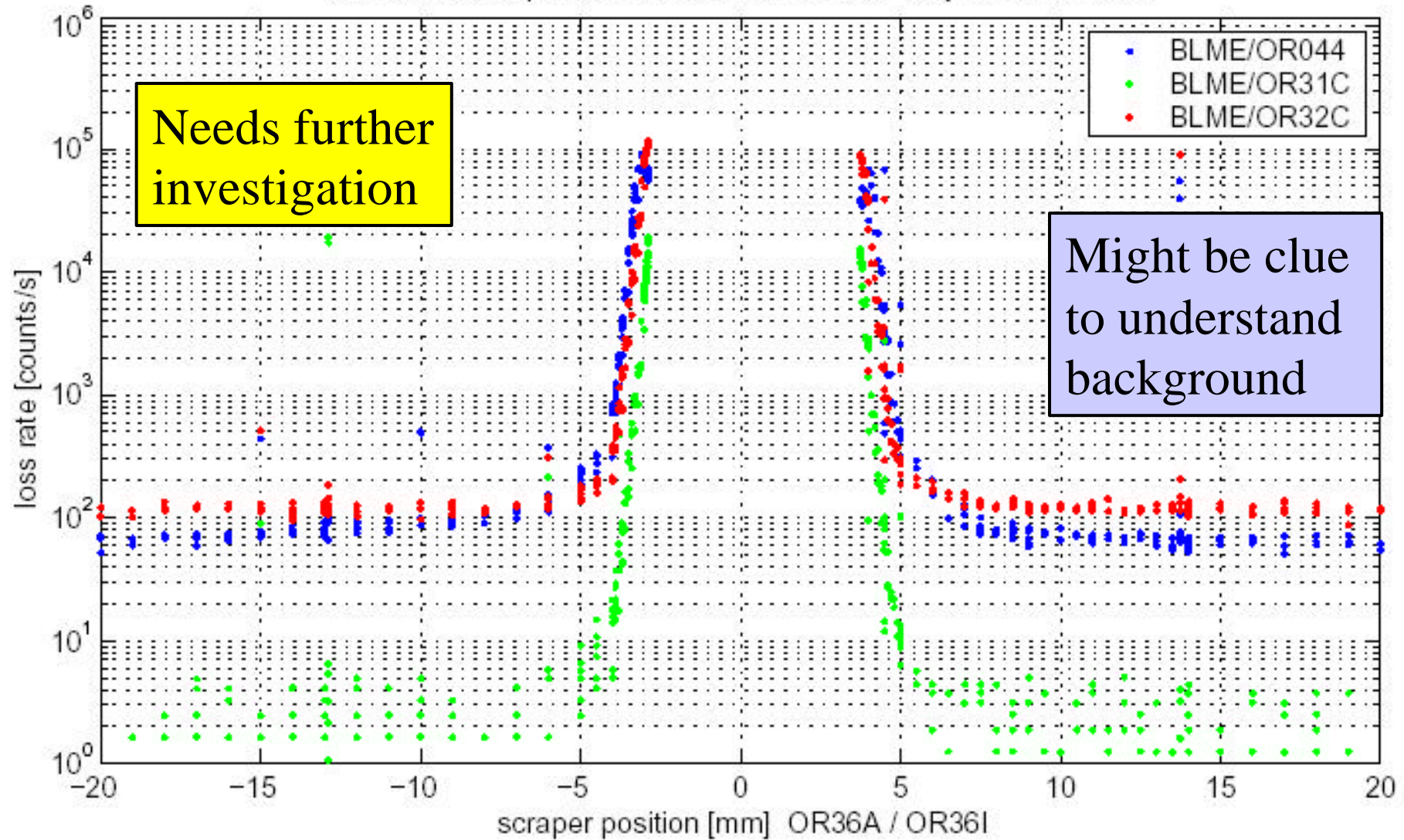


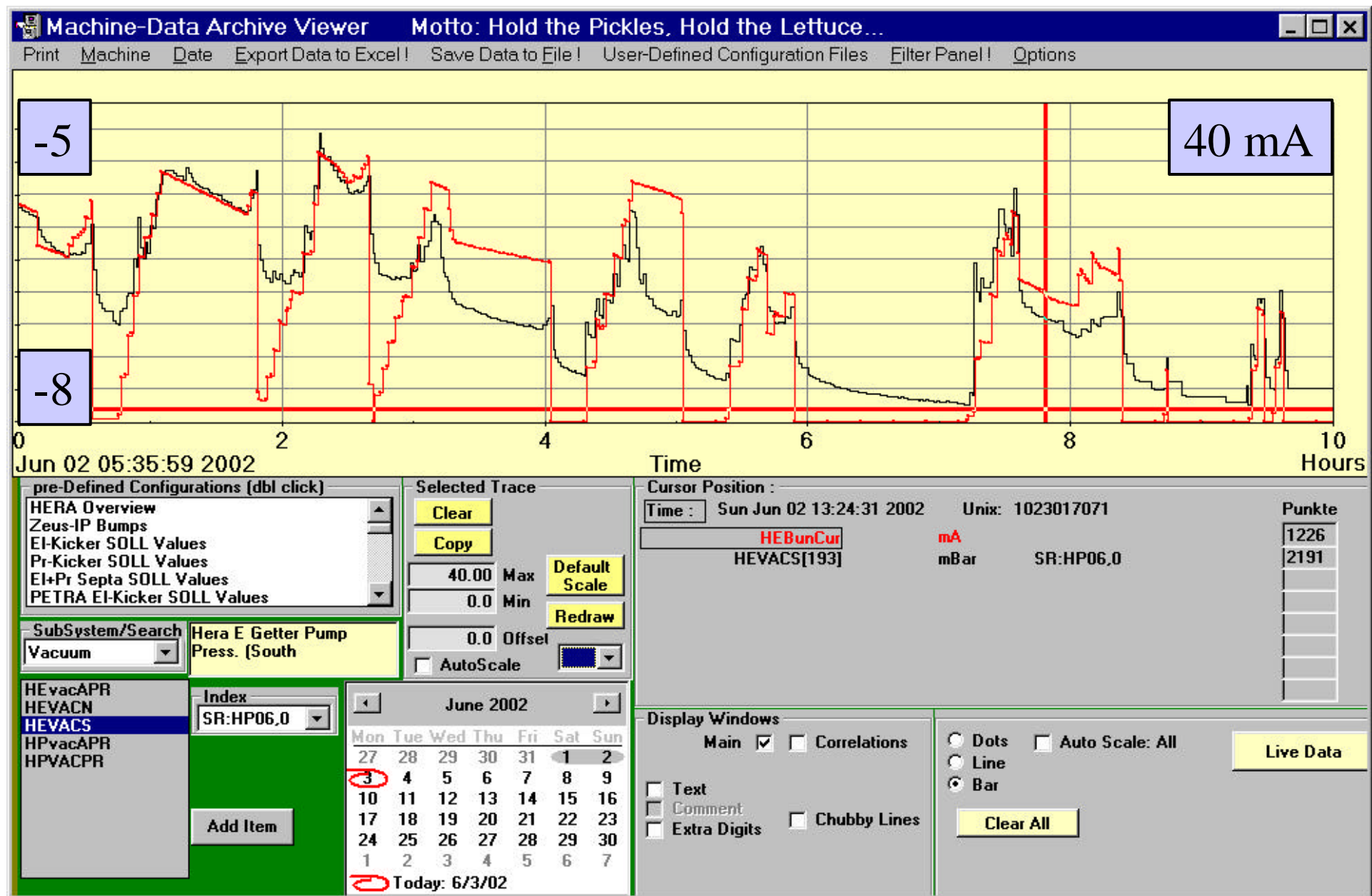
Investigation of Beam Halo

Vertical Scraper Measurement 27 GeV 28-May-2002 14:49:02



Horizontal Scraper Measurement 27 GeV28-May-2002 15:17:39

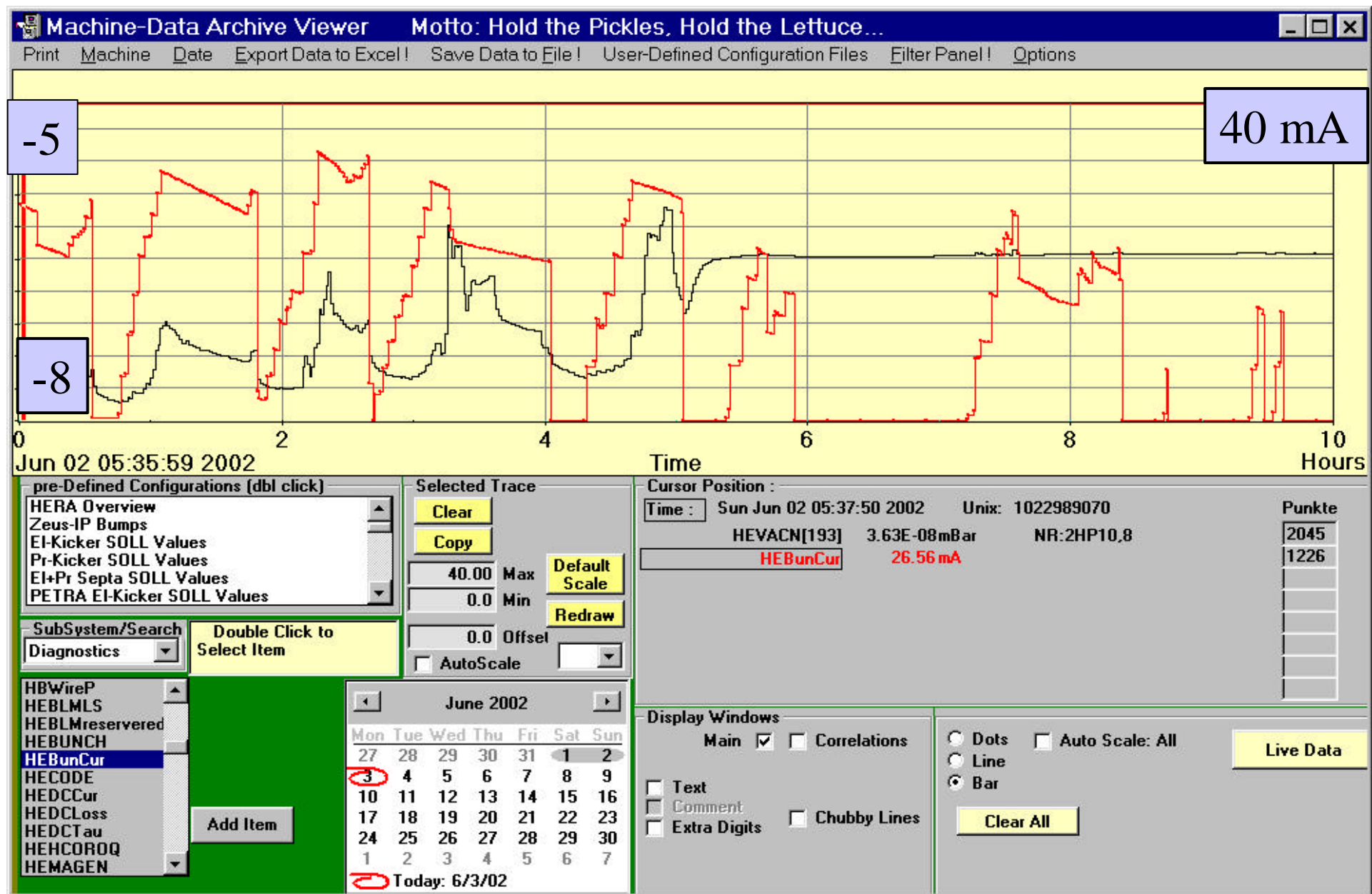




June 3rd 2002

D.Trines ESC

26



June 3rd 2002

D.Trines ESC

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Conclusions

- Specific luminosity is close to expectation
- Strong efforts are being made to improve reliability
- Scientific manpower has been substantially strengthened
- Understanding of backgrounds in experiments has highest priority. There is progress.